

Conjugate Etalon Spectral Imager (CESI) & Scanning Etalon Methane Mapper (SEMM), Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



ABSTRACT

Development of the CESI focal plane and optics technology will lead to miniaturized hyperspectral and SWIR-band spectral imaging instrumentation compatible with CubeSat and other nanosat platforms. The project will implement the technology by developing a CubeSat-compatible SEMM instrument for global mapping of atmospheric methane concentrations. Specific Phase I technical objectives include: - Perform a trade study comparing the performance potential of alternate concepts for a miniaturized spectrometer with respect to the methane mapping mission. - Demonstrate that the image of a scene collected through an interferometer is a product of the scene radiance pattern with the interferogram. - Build a laboratory prototype and demonstrate enhanced detection of a multi-line molecular absorption band. - Test novel detector devices suitable for high-gain, low-noise SWIR imaging in a nanosat setting. - Develop the instrument architecture for SEMM and validate the concept analytically by a radiometric model. - Design the high sensitivity, low-noise SWIR focal plane for SEMM. The CESI project is undertaken by Wavefront LLC with the Space Dynamics Lab (SDL) collaborating as the research institution. The key personnel are the Project Manager and the Principle Investigator (from Wavefront) and the scientists (from SDL). The duration of Phase I is 12 months. During Phase II, SDL will prototype the complete CESI instrument incorporating Wavefront's novel high-sensitivity focal plane and readout over 24-month duration.

ANTICIPATED BENEFITS

To NASA funded missions:

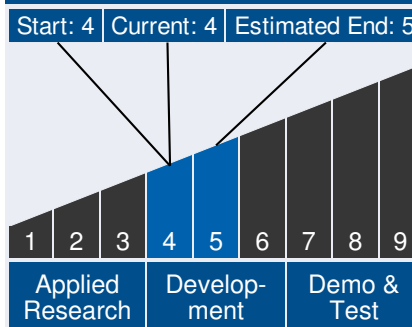
Potential NASA Commercial Applications: NASA Applications for the CESI technology include: - hyperspectral imaging of terrestrial and planetary surfaces; - remote atmospheric analysis, e.g. sounding and solar occultation; - sensitive, high-gain SWIR detectors and focal planes; - photon-counting focal planes and miniaturized spectrometers for planetary missions; -



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Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

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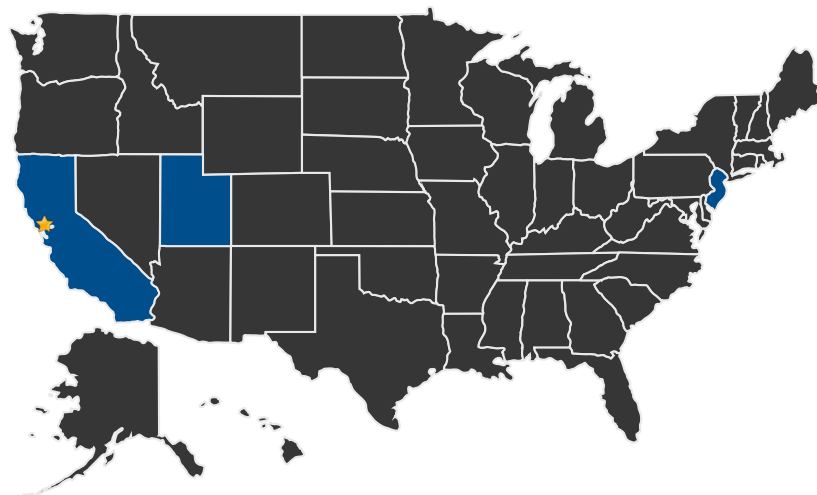


global methane mapping of the Earth in support of the Earth System mission.

To the commercial space industry:

Potential Non-NASA Commercial Applications: Commercial applications for the CESI technology include: - hyperspectral earth imaging for applications in mineralogy, agriculture, environmental management, etc; - night-vision, laser protection, miniature cameras, and other low-light applications; - high-sensitivity focal planes for flash lidar and free-space optical communications; and - prosthetic vision aids for low-vision patients.

U.S. WORK LOCATIONS AND KEY PARTNERS



■ U.S. States
With Work

★ **Lead Center:**
Ames Research Center

Other Organizations Performing Work:

- Utah State University Research Foundation - SDL (North Logan, UT)
- Wavefront, LLC (Basking Ridge, NJ)

Management Team (cont.)

Project Manager:

- Kim Hines

Principal Investigator:

- Jie Yao

Technology Areas

Primary Technology Area:

Science Instruments, Observatories, and Sensor Systems (TA 8)

└ Remote Sensing Instruments and Sensors (TA 8.1)

└ Lasers (TA 8.1.5)

└ 1.65 μ m Pulsed Light Detection and Ranging (LIDAR) (TA 8.1.5.10)

Secondary Technology Area:

Science Instruments, Observatories, and Sensor Systems (TA 8)

└ Remote Sensing Instruments and Sensors (TA 8.1)

└ Detectors and Focal Planes (TA 8.1.1)

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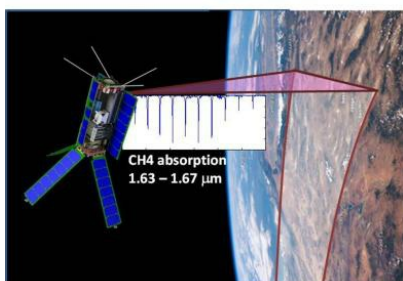


PROJECT LIBRARY

Presentations

- Briefing Chart
 - (<http://techport.nasa.gov:80/file/23098>)

IMAGE GALLERY



Conjugate Etalon Spectral Imager (CESI) & Scanning Etalon Methane Mapper (SEMM), Phase II

DETAILS FOR TECHNOLOGY 1

Technology Title

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Potential Applications

NASA Applications for the CESI technology include: - hyperspectral imaging of terrestrial and planetary surfaces; - remote atmospheric analysis, e.g. sounding and solar occultation; - sensitive, high-gain SWIR detectors and focal planes; - photon-counting focal planes and miniaturized spectrometers for planetary missions; - global methane mapping of the Earth in support of the Earth System mission.